A NEW FAMILY OF EQUITY STYLE INDICES AND MUTUAL FUND PERFORMANCE: DO LIQUIDITY AND IDIOSYNCRATIC RISK MATTER?

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1 Motivation

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   - Risk factor exposures
   - Model comparisons
   - Mutual fund performance

4 Implications
Motivation

- Liquidity and idiosyncratic risk as determinants of mutual fund performance?
- Preferences for risk exposures?
- Joint role of liquidity and idiosyncratic risk is quite unexplored.
- Contribution to models of performance measurement is unknown.
- Evidence on mutual fund performance is scarce.
Derivation of risk factors from European equity style indices:

- Universe of the Stoxx 600
- We use index weights, quarterly rebalancing.
- Define **six risk factors**: market excess return, size, valuation, momentum, liquidity and idiosyncratic risk.
Liquidity

- Commonality in liquidity: Chordia et al. (2000); Huberman and Halka (2001).
- Priced risk factor: Pastor and Stambaugh (2003); Acharya and Pedersen (2005); Liu (2009).

Significant and positive liquidity risk premium, sample estimate is 6.20% p.a.: 

\[ H_0: \]

Fund managers choose high systematic illiquidity exposure in order to achieve higher performance.

Redemptions in periods of crisis, see Clarke et al. (2007); Huang (2008); Cao et al. (2009): 

\[ H_1: \]

Fund managers choose low illiquidity exposure in order to be able to react to fund flows.
Idiosyncratic Risk

- Idiosyncratic risk in asset pricing models e.g. due to incomplete diversification see Merton (1987).
- Explanatory factor in the cross-section of expected returns; Malkiel and Xu (2006) and Fu (2009).

$H_0^2$:

Mutual fund managers tend to underweight stocks with low idiosyncratic volatility.

Empirical evidence in Falkenstein (1996) and behavioral explanation of e.g. Malkiel and Xu (2006).
Liquidity and Idiosyncratic Risk (I/II)

Link implied by inventory control models of market making and the pricing model of Merton (1987), see Spiegel and Wang (2006). Role in cross-section of mutual fund returns is unclear:

- However, high idiosyncratic risk firms tend to be those with the least liquidity, see Spiegel and Wang (2006).
- Explanatory power of idiosyncratic risk in cross-section of stock returns is not diminished by considering liquidity, see Malkiel and Xu (2006).
Both, asset liquidity and idiosyncratic risk explain aggregate fund holdings, see Falkenstein (1996).

\[ H_0^3: \]

Both, fund managers choice of idiosyncratic risk and liquidity exposure relates to fund performance.

→ Up to now, Fama and French and Carhart models have not been jointly extended via liquidity and idiosyncratic risk.
→ Are liquidity and idiosyncratic risk useful extensions of multifactor models of performance evaluation?
**Multifactor Model to Measure Risk-Adjusted Mutual Fund Performance:**

\[ r_{i,t} - r_{f,t} = \alpha_i + \beta_{i,1}(r_{M,t} - r_{f,t}) + \sum_{k=2}^{m} \beta_{i,k} f_{k,t} + \epsilon_{i,t}. \]

- Daily analysis of mutual funds consistent with information arrival and investment decision frequency of fund managers.
- OLS with heteroskedasticity and autocorrelation consistent covariance estimator of Newey and West (1987).
- Set of 529 mutual funds with European investment focus.
Multifactor Models

Standard and extended models:

- Carhart (4-Factor Model)
- Fama-French (FF) with liquidity (4-factor model)
- Fama-French (FF) with idiosyncratic risk (4-factor model)
- Carhart with liquidity (5-factor model)
- Carhart with idiosyncratic risk (5-factor model)
- Carhart with liquidity and idiosyncratic risk (6-factor model)

Model comparisons will be conducted based on adjusted $R^2$ (nested models) and J-tests (non-nested models), see Davidson and MacKinnon (1981).
Market excess return and size are relevant determinants of fund performance with respect to almost all funds. → Result is stable across models.

Other benchmark / risk factors are only relevant for subsets of funds, but with almost equal importance.

In contrast to the other factors, valuation is not so stable across the different models.

Average valuation exposure is even dominated by liquidity and idiosyncratic risk in augmented Fama and French models.
Fund managers on average focus more on value, past winner and liquid stocks in the cross-section of mutual fund returns:

**Table**: Risk exposures

<table>
<thead>
<tr>
<th>Carhart with liqu. and idios. risk</th>
<th>Sign. neg. (5%-level)</th>
<th>Sign. pos. (5%-level)</th>
<th>Median risk exp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market exc. ret.</td>
<td>0.00%</td>
<td>86.01%</td>
<td>0.718</td>
</tr>
<tr>
<td>Size</td>
<td>4.91%</td>
<td>75.61%</td>
<td>0.470</td>
</tr>
<tr>
<td>Valuation</td>
<td>9.83%</td>
<td>19.85%</td>
<td>0.033</td>
</tr>
<tr>
<td>Momentum</td>
<td>4.35%</td>
<td>32.33%</td>
<td>0.050</td>
</tr>
<tr>
<td>Illiquidity</td>
<td>17.39%</td>
<td>9.26%</td>
<td>-0.032</td>
</tr>
<tr>
<td>Idiosyncratic risk</td>
<td>19.47%</td>
<td>11.91%</td>
<td>-0.001</td>
</tr>
<tr>
<td>Median adj. $R^2$</td>
<td>0.627</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median F-stat.</td>
<td>363.438</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mutual Fund Risk Exposures (III/III)

- Around thirty percent of the funds are characterized by a significant sensitivity with respect to the illiquidity factor, with evidence more in favor of liquidity.
  \[\rightarrow\] In line with Huang (2008): fund managers prefer liquid holdings when the market is expected to be more volatile.
- This is neither influenced by the other above mentioned risk factors nor by idiosyncratic risk.
- No aggregate preference towards idiosyncratic risk, but slightly more evidence of aversion to idiosyncratic risk.
- No evidence of behavioral hypothesis of Malkiel and Xu (2006).
1 Comparisons by adjusted $R^2$: six factor Carhart model augmented by liquidity and idiosyncratic risk dominant.

2 Non-nested tests compared by J-test of Davidson and MacKinnon (1981):
   
   - Conducted with respect of beta decile fund portfolios based on a beta ranking derived from a univariate market model.
   - With respect to five factor models, the liquidity augmented Carhart model is slightly preferable.
Carhart is dominating liquidity as well as idiosyncratic risk augmented Fama and French models:

**Table:** Results of J-test (beta deciles)

<table>
<thead>
<tr>
<th>FITTED VALUES FROM CARHART</th>
<th>IN FF WITH IDIOS. RISK</th>
<th>IN FF WITH LIQU.</th>
<th>FITTED VALUES FROM CARHART</th>
<th>IN FF WITH IDIOS. RISK</th>
<th>IN FF WITH LIQU.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BETA D 1</td>
<td>0.624</td>
<td>0.652</td>
<td>BETA D 6</td>
<td>0.037**</td>
<td>0.077*</td>
</tr>
<tr>
<td>BETA D 2</td>
<td>0.078*</td>
<td>0.170</td>
<td>BETA D 7</td>
<td>0.000***</td>
<td>0.000***</td>
</tr>
<tr>
<td>BETA D 3</td>
<td>0.096*</td>
<td>0.176</td>
<td>BETA D 8</td>
<td>0.000***</td>
<td>0.000***</td>
</tr>
<tr>
<td>BETA D 4</td>
<td>0.039**</td>
<td>0.109</td>
<td>BETA D 9</td>
<td>0.011**</td>
<td>0.036**</td>
</tr>
<tr>
<td>BETA D 5</td>
<td>0.144</td>
<td>0.234</td>
<td>BETA D 10</td>
<td>0.692</td>
<td>0.561</td>
</tr>
</tbody>
</table>
Comparisons on four factor models:

- Four factor models are more parsimonious, no over-fitting.
- Always include **market and size**, while allowing for variation on the remaining risk factors.
- Four factor model only with liquidity and idiosyncratic risk is **strongly dominated**.
- Carhart model as well as a model including market, size, momentum and liquidity arise as **most preferable** models.

→ Role of valuation factor may be dominated by liquidity!
Majority of funds possesses a **neutral risk-adjusted performance** after costs.

Major part of remaining funds is characterized by a **negative abnormal return**.

None of the funds with significant illiquidity exposure has a significantly positive abnormal return.

Main results are not changed before costs.
**Table:** Performance evaluation

<table>
<thead>
<tr>
<th></th>
<th>Mean $\alpha_i$ p.a.</th>
<th>Sign. neg. alphas (10%-level)</th>
<th>Sign. pos. alphas (10%-level)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.033</td>
<td>17.39%</td>
<td>0.57%</td>
</tr>
<tr>
<td>Sign. neg. alphas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(10%-level)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indiff. alphas</td>
<td></td>
<td>82.04%</td>
<td></td>
</tr>
<tr>
<td>(10%-level)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sign. pos. alphas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(10%-level)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-value (smallest t-stat.)</td>
<td></td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Bonferroni-adj. 10%-signif.-level</td>
<td></td>
<td></td>
<td>0.0002</td>
</tr>
<tr>
<td>P-value (largest t-stat.)</td>
<td></td>
<td></td>
<td>0.0429</td>
</tr>
</tbody>
</table>

Bonferroni adjustment (stricter confidence level): hypothesis is not rejected that alphas are jointly negative.
Average risk-adjusted performance: around -3 % p.a.
Average adjusted $R^2$: around 58 percent.
• Market risk can not be hedged.
• Size exposure indicates exposure to small (eventually undervalued) stocks.
• Balanced aggregate exposure for the remainder four risk factors.
• $H^1_0$, preference for illiquidity, is rejected.
• $H^2_0$, preference for idiosyncratic risk, is rejected.
Liquidity and idiosyncratic risk capture different aspects in the cross-section of mutual fund returns, $H^3_0$, is not rejected.

Liquidity and idiosyncratic risk do not dominate the other risk factors, but contribute to models of fund performance.

The liquidity factor tends to dominate the valuation factor.
Robustness Tests

- Non-synchronous trading, see Dimson (1979); Asness et al. (2001).
- Different model specifications: equal-weighted risk factors, detrended illiquidity, alpha, outliers in liquidity and idiosyncratic risk factors.
- Multicollinearity as indicated by the variance inflation factor
- Gross vs. net performance
- Monthly data
- Bonferroni adjustment for significance of risk exposures
- Subperiods: division of sample period into halves
- Performance evaluation regarding beta decile groups


References II


